

IN THE CLAIMS:

1. (Amended Twice) A direct current sum bandgap voltage comparator comprising:

a summing node;

a plurality of current sources connected to the summing node, each current source further comprising at least one transistor, and each current source supplying a current to the summing node and being connected to a power supply voltage, wherein the currents sources supply currents according to a bandgap equation:

$$K_1 (V_{CC} - V_T) + K_1 V_T = K_2 V_{BE} + K_3 (kT/q)$$

where  $V_{CC}$  is the power supply voltage,  $V_T$  is the predetermined threshold voltage which defines the minimum acceptable voltage of  $V_{CC}$ ,  $V_{BE}$  is a base emitter voltage defined by a selected transistor which comprises a current source within the plurality of current sources, and  $kT/q$  is equal to a thermal voltage where  $k$  is Boltzman's constant,  $T$  is the temperature in kelvin,  $q$  is the electronic charge, and  $K_1$ ,  $K_2$ , and  $K_3$  are constants; and

an indicator circuit having an input connected to the summing node and generating a logical signal at an output, responsive to voltage changes in the summing node.

1 4. (Amended Twice) A direct current sum bandgap voltage  
2 comparator comprising:

3  
4 a summing node;

5  
6 a plurality of current sources connected to the summing  
7 node, each current source further comprising at least one  
8 transistor, and each current source supplying a current to the  
9 summing node and being connected to a power supply voltage; and

10  
11 an indicator circuit having an input connected to the  
12 summing node and generating a logical signal at an output,  
13 responsive to voltage changes in the summing node, wherein the  
14 currents sources supply currents according to a bandgap equation:

$$K_1(V_{CC}-V_T) + K_1V_T = K_2V_{BE} + K_3(kT/q)$$

15  
16 where  $V_{CC}$  is the power supply voltage,  $V_T$  is the predetermined  
17 threshold voltage which defines the minimum acceptable voltage  
18 of  $V_{CC}$ ,  $V_{BE}$  is a base emitter voltage defined by a selected  
19 transistor which comprises a current source within the plurality  
20 of current sources, and  $kT/q$  is equal to a thermal voltage where  
21  $k$  is Boltzman's constant,  $T$  is the temperature in kelvin,  $q$  is  
22 the electronic charge, and  $K_1$ ,  $K_2$ , and  $K_3$  are constants and  
23 wherein the plurality of current sources comprises four current  
24 mirrors.

25  
26 9. (Amended Twice) The direct current sum bandgap voltage  
27 comparator of claim 8 further comprising a clamping circuit  
28 connected to the summing node, wherein a voltage swing for the  
29 summing node, responsive to changes in current supplied by the  
30 current mirrors, may be set between [selected] predetermined  
31 voltages.

32  
33 10. (Amended Twice) The direct current sum bandgap voltage  
34 comparator of claim 8 further comprising a cascode stage having  
35 at least a first and second connections, the first connection is  
36 connected to the summing node and the second connection is  
37 connected to one of the four current mirrors. [located between  
38 the summing node and the current mirrors.]

1 14. (Amended Twice) A zero power circuit comprising:

2  
3 a first circuit;

4  
5 a direct current sum bandgap voltage comparator comprising:

6  
7 a summing node;

8  
9 a plurality of current sources connected to the summing  
10 node, each current source further comprising at least one  
11 transistor, and each current source supplying a current to the  
12 summing node and being connected to a power supply voltage,  
13 wherein the current sources supply according to a bandgap  
14 equation:

$$K_1 (V_{CC} - V_T) + K_1 V_T = K_2 V_{BE} + K_3 (kT/q)$$

15  
16 where  $V_{CC}$  is the power supply voltage,  $V_T$  is the predetermined  
17 threshold voltage which defines the minimum acceptable voltage  
18 of  $V_{CC}$ ,  $V_{BE}$  is a base emitter voltage defined by a selected  
19 transistor which comprises a current source within the plurality  
20 of current sources, and  $kT/q$  is equal to the thermal voltage,  
21 where  $k$  is Boltzman's constant,  $T$  is the temperature in kelvin,  
22  $q$  is the electronic charge, and  $K_1$ ,  $K_2$ , and  $K_3$ , are constants[.];  
23 [and]

24  
25 an indicator circuit having an input connected to the  
26 summing node and generating a logical signal at an output,  
27 responsive to changes in the summing node; and

28  
29 a switching circuit for providing power to the first circuit  
30 from a primary power supply and a secondary power supply, the  
31 switching circuit being connected to the output of the indicator  
32 circuit, wherein power from the primary power supply is supplied  
33 to the first circuit if the logical signal indicates that the  
34 power supply voltage is equal to or greater than the  
35 predetermined threshold voltage [preselected voltage] and power  
36 from the secondary power supply is supplied to the first circuit  
37 if the power supply voltage is less than the predetermined  
38 threshold voltage [preselected voltage].

17. (Amended Twice) A zero power circuit comprising:

a first circuit;

a direct current sum bandgap voltage comparator comprising:

a summing node;

a plurality of current sources connected to the summing node, each current source further comprising at least one transistor, and each current source supplying a current to the summing node and being connected to a power supply voltage[-];

[and]

an indicator circuit having an input connected to the summing node and generating a logical signal at an output, responsive to changes in the summing node; and

a switching circuit for providing power to the first circuit from a primary power supply and a secondary power supply, the switching circuit being connected to the output of the indicator circuit, wherein power from the primary power supply is supplied to the first circuit if the logical signal indicates that the power supply voltage is equal to or greater than the preselected voltage and power from the secondary power supply is supplied to the first circuit if the power supply voltage is less than the preselected voltage, wherein the current sources supply according to a bandgap equation:

$$K_1 (V_{CC} - V_T) + K_1 V_T = K_2 V_{BE} + K_3 (kT/q)$$

where  $V_{CC}$  is the power supply voltage,  $V_T$  is the predetermined threshold voltage which defines the minimum acceptable voltage of  $V_{CC}$ ,  $V_{BE}$  is a base emitter voltage defined by a selected transistor which comprises a current source within the plurality of current sources, and  $kT/q$  is equal to the thermal voltage, where  $k$  is Boltzman's constant,  $T$  is the temperature in kelvin,  $q$  is the electronic charge, and  $K_1$ ,  $K_2$ , and  $K_3$ , are constants and wherein the plurality of current sources comprises four current mirrors.

1 27. (Amended) A direct current sum bandgap voltage comparator  
2 comprising:

3  
4 a power supply having a predetermined threshold voltage  
5 level which defines the minimum acceptable voltage level of the  
6 power supply;

7  
8 a summing node;

9  
10 a plurality of current sources connected to the summing node  
11 and directly connected to a power supply voltage, each current  
12 source further comprising at least one transistor, and each  
13 current source supplying a current to the summing node[, wherein  
14 the summing node voltage level is responsive to the currents  
15 supplied]; and

16  
17 an indicator circuit having an input connected to the  
18 summing node, wherein the indicator circuit is responsive to  
19 changes in the summing node voltage level and generates at an  
20 output a logical signal at one state when the summing node  
21 voltage level is greater than [a] the predetermined threshold  
22 voltage level [value] and generates the logical signal at the  
23 output at another state when the summing node voltage level is  
24 less than the predetermined threshold voltage level [value, the  
25 predetermined value corresponding to a preselected power supply  
26 voltage].

1 28. (Amended) The direct current sum bandgap voltage comparator  
2 of claim 27, wherein the currents sources supply currents  
3 according to a bandgap equation:

$$K_1(V_{CC}-V_T) + K_1 V_T = K_2 V_{BE} + K_3 (kT/q)$$

4  
5 where  $V_{CC}$  is the power supply voltage,  $V_T$  is the predetermined  
6 threshold voltage level,  $V_{BE}$  is a base emitter voltage defined by  
7 a selected transistor which comprises a current source within the  
8 plurality of current sources, and  $kT/q$  is equal to a thermal  
9 voltage where  $k$  is Boltzman's constant,  $T$  is the temperature in  
10 kelvin,  $q$  is the electronic charge, and  $K_1$ ,  $K_2$ , and  $K_3$  are  
11 constants.

12  
13 30. (Amended) The direct current sum bandgap voltage comparator  
14 of claim 1 [3], wherein the plurality of current sources are  
15 current mirrors.